

6

Treatment Manual

Certifying Facilities

Certification of Cold Treatment

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Introduction

Since the early 1900s, sustained cold temperature has been employed as an effective postharvest method for the control of the Mediterranean and certain other tropical fruit flies. Exposing infested fruit to temperatures of 2.2°C (36°F) or below for specific periods results in the mortality of the various life stages of this group of notoriously injurious insects. Procedures were developed so that cold treatment can be effectively applied to fruit while in transport in refrigerated holds of ships, in refrigerated containers, and in warehouses located in the country of origin or in the United States.

The U.S. Department of Agriculture (USDA) incorporates this method of eradication in its regulations to facilitate the importation of certain types of fruit from areas of the world where tropical fruit flies, and other insects which can be similarly controlled, are among the significant fruit pests of concern. Under prescribed conditions, agreements are made between USDA and the appropriate governmental agency of a country of export, for establishing procedures of operation. The procedures provide for temperature equipment control by requiring calibration tests prior to each loading and for air circulation control by a prescribed method of storage under monitoring. Other aspects of the operation and certification are designed to ensure an overall control of the treatment procedures at the point of origin and during the treatment.

For intransit treatment, the entire treatment procedure is reviewed for accuracy and completeness by USDA inspectors when the carrier arrives at a U.S. port of entry. In the case of warehouse treatments, the temperatures are checked periodically during the treatment, and the entire temperature record is reviewed at the end of the treatment period.

Facilities for intransit and warehouse cold treatment are subject to approval by USDA. Approval is needed only when treating fruit under USDA regulations, and does not constitute an endorsement for the carrying or storage of refrigerated cargo.

Vessels Used for Intransit Cold Treatment

General Requirements for Approval of Refrigerated Compartments

A vessel must have adequate refrigeration, insulation, and thermostatic control to precool and hold fruit at 2.2°C (36°F) or below for the entire voyage. Proper design of compartments is necessary to assure good distribution of circulating air so that all parts of the cargo spaces are maintained at approximately the same temperature level. USDA does not furnish specifications for refrigerating equipment or designs for compartment construction. However, reefer vessels presented for approval must be classified under the rules of the American Bureau of Shipping or a comparative internationally recognized ship classification society.

Application for approval of refrigerated compartments must be made in writing to the Center for Plant Health Science & Technology, USDA-APHIS-PPQ-CPHST, Treatment Quality Assurance Unit, 1730 Varsity Drive, Suite 400, NC 27606. In applying for approval of compartments aboard a specific vessel or series of vessels, the owner or builder should provide plans and drawings of the refrigerated compartments showing dimensions, air circulation, and other specifications of the refrigerating equipment. From this information, the number of temperature sensors required in each compartment and their location, will be specified by means of a drawing. For each new building requiring approval, it will be necessary to submit the number of sets of drawings to be approved and stamped, with one additional set to be filed at the Center for Plant Health Science & Technology (CPHST).

The owner or builder should also submit specifications showing the complete recording system to be installed, including the recorder and sensors. These specifications must be reviewed and the system approved before installation. After installing the system, the vessel should be made available at a U.S. port for final inspection. For

inspection to be made at a foreign location, prior arrangements and a cooperative agreement must be established with USDA. Generally, a 60-day notification is needed before the inspection can be scheduled. For specific information on the required procedure, contact Quarantine Policy, Analysis and Support (QPAS), Preclearance Programs, USDA-APHIS-PPQ, 4700 River Road, Unit 67, Riverdale, MD 20737. Calibration and identification tests will be made during such an inspection. Clean containers filled with crushed ice and fresh water have to be made available for the immersion of the temperature sensors. If containers are not insulated, the refrigerated compartments must be near 0° to 1.1°C (32° to 34°F). A communication system must also be made available to facilitate communication between personnel in the compartments and the recording room.

A representative from the temperature recorder instrument company, who is familiar with the installation, should be on hand to advise on the performance of the instrument and to correct any deficiencies. Before requesting final inspection, the vessel's owner must complete all arrangements.

Upon meeting all requirements, the vessel will be designated as approved to conduct intransit cold treatments under the provisions of the PPQ's Fruit and Vegetable Quarantine 56. A Certificate of Approval listing the approved refrigerated compartments will be issued to the vessel. This certificate will expire three (3) years from the date of inspection. Request for renewal has to be given sixty (60) days before expiration to the Center for Plant Health Science & Technology (CPHST). Arrangements for the certification survey are to be made with the local PPQ office at the port of arrival. This approval is for equipment only, and each shipment of fruit must satisfy all requirements as described in Section 319.56-2d of Quarantine 56, as a condition of entry for importation into the United States.

Special Requirements for Approval of Refrigerated Compartments

In the event that owners wish to qualify their vessel to carry fruit in other than the standard stowage arrangement, the following additional data must be submitted:

- ◆ An analysis of load and equipment balance.
- ◆ A schematic diagram of the air distribution pattern with specific reference to those areas most difficult to cool under load conditions.
- ◆ Test results of the air delivery system in terms of distribution balance.

Actual performance tests under treatment conditions will be required before approval.

Standards for Temperature Recording Systems

The standards are intended to meet the USDA requirements for a temperature recording installation for use on vessels engaging in the intransit cold treatment of fruit. The recording system must have an overall accuracy of plus or minus 0.3°C in the range of -3° to +3°C or plus or minus 0.5°F in the range of +27° to +37°F, with a resolution of 0.1°C or 0.1°F. The design, construction, and materials used, shall be such, that the performance of the installation is unaffected by marine conditions. Plans and specifications of the temperature recording instrument and equipment are to be submitted for review and approval. These are to include details of all components of the recording installation.

Recording Instruments.

- ◆ Accuracy Standards—The readings of the instrument have to be accurate to within plus or minus 0.15°C of the true temperature in the range of -3°C to +3°C or plus or minus 0.25°F of the true temperature in the range of +27°F to 37°F, in the usual conditions of inclination, vibration, and environment associated with marine service. The instrument must be capable of repeatability in the range of -3°C to +3°C (+27°F to +37°F).
- ◆ Display Standards for Strip Chart Recorders—The scale deflection of the chart cannot be less than 0.10 inches for each degree Fahrenheit, and not less than 5 mm for each degree Celsius. A print interval of approximately 2 minutes and a chart speed near 5 cm per hour is usually satisfactory.

The chart scale shall be graduated with major scale marks at every degree, and minor scale marks at every 0.2 of a degree.

Temperature values for each sensor must print at least once every hour.

Each symbol on the print wheel must correspond to and identify the sensor it represents.

Charts have to be of sufficient length to display a complete treatment record during the voyage.

- ◆ Display Standards for Data Logger—For each sensor, the temperature value, location and/or identification, and test point print at least once an hour on continuous log sheets with identified temperature points accurate to one decimal place.

Each hourly entry must contain a clear, fully informative record including the date and time. Text may be preprinted, or printed at the time of each temperature printout.

- ◆ see **Appendix H** for a list of temperature recorders approved by APHIS for self-refrigerated containers.

Commercial suppliers for these recording instruments are listed under Temperature Recorders for self-refrigerated containers under USDA cold treatment regulations in Appendix H, Reference Guide to Commercial Suppliers of Treatment and Related Safety Equipment.

Temperature Sensors.

- ◆ **Construction Standards:** Sensors designated for fruit temperatures should have an outer sheath of 0.25 inch (6.4 mm) diameter, or less. The sensing unit must be located within the first inch of the sensor.
- ◆ **Accuracy Standards:** The sensors have to be accurate to plus or minus 0.15°C in the range of -3°C to +3°C or within plus or minus 0.25°F in the range of +27°F to +37°F.

The sensors must show a steady indication of temperatures within three (3) minutes when immersed in a mixture of crushed ice and water.

- ◆ **Identification:** All sensors in the refrigerated compartments must be identified so as to distinguish the sensors in one compartment from those in others (e.g., A1, A2, . . . , B1, B2, . . . , etc.). A common letter designation is also required for twin deck compartments.

The sensors for each compartment have to be identified so that the air sensors are numbered first (e.g., A1, A2 — air; A3, A4, . . . , etc., — fruit pulp).

All sensors will be identified according to the assigned number from the recording system. This number must be placed on the box where the sensor is stowed or on the bulkhead near the sensor and on a permanent tag attached to the cable near the sensor.

A diagram illustrating the location and identification of every sensor by compartment should be posted adjacent to the recording instrument.

1. Location:

- A. Air sensors—**Sensors have to be located on the center line of the vessel approximately 30 centimeters from the ceiling.

Sensors must be attached in such a way that they do not touch the bulkhead and are protected from damage from the cargo.

Should be readily detachable and connected to cables at least 5 meters in length for ease of calibration.

One sensor has to be located on the fore and one on the aft bulkheads of each compartment. In the case of twin deck compartments, two sensors are required in the upper compartment plus one sensor in the lower compartment. This sensor is to be located on the bulkhead furthest from the cooling unit.

Shall be stowed in compartments to protect from damage when not in use.

- B.** Fruit sensors—Must be distributed throughout the compartment so that all areas of the compartment can be reached (5 to 15 meter cable lengths are usually sufficient).
- 2.** Installation Standards: The equipment is to be installed in accordance with the highest standard of the classification society of concern.

The number, location, and identification of sensors will be specified in accordance with the submitted drawings of the refrigerated spaces.

The number of temperature sensors is based upon the cubic capacity of the compartment.

The following table can be used to determine the number of sensors required per compartment based on the cubic capacity:



It is highly recommended that more temperature sensors be installed than the minimum number required for each refrigerated compartment. If a sensor malfunctions during a treatment, the Port Director has the option of disregarding it, providing that an additional working sensor is present, and the functional sensors were uniformly distributed. Otherwise, the entire treatment must be repeated for the fruit in that compartment.

Two of the sensors shall be designated as air sensors, and the others as fruit sensors. (see previous page for required locations.) Any sensors above the required minimum may be either fruit or air sensors.

For compartments exceeding 100,000 cubic feet, contact the Center for Plant Health Science & Technology (CPHST) for the minimum number of required sensors"

Cubic Capacities		
Cubic Feet	Cubic Meters	Number of Sensors (Minimum)
0 to 10,000	0 to 283	4
10,001 to 15,000	284 to 425	5
15,001 to 25,000	426 to 708	6
25,001 to 45,000	709 to 1,274	7
45,001 to 70,000	1,275 to 1,980	8
70,001 to 100,000	1,981 to 2,830	10

Integral Containers Used for Cold Treatment

General Requirements for Approval

Requests for approval of refrigerated containers must be made in writing to: USDA-APHIS-PPQ-CHPST, Center for Plant Health Science & Technology, 1017 Main Campus Drive, Suite 2500, NC 27606. The following specifications should be submitted for each container series for which approval is required (see container specification form in [Appendix A](#)):

- ◆ Container size
- ◆ Make and model of refrigeration unit
- ◆ Air flow type
- ◆ Air flow rate at 2 or more water pressures
- ◆ Controller type
- ◆ Adjustment capability and accuracy

Containers must have adequate refrigeration, insulation, and thermostatic control to precool and uniformly hold fruit temperatures at 2.2°C (36°F) or below for the entire treatment period.

Standards for Temperature Recording Instruments

Recording instruments to be used for cold treatments conducted in self-refrigerated containers must be approved by the Center for Plant Health Science & Technology (CPHST). When applying for approval, the specifications of the recorder and sensors must be submitted.

The readings of the instrument have to be accurate to within plus or minus 0.3°C of the true temperature in the range of -3°C to +3°C, or plus or minus 0.5°F of the true temperature range of +27°F to +37°F, with a resolution of 0.1°F or C°

Sensors also will have an outer sheath of .25 inch (6.4 mm) diameter or less. The sensing element must be located within the first inch (2.5 cm) of the sensor.

Sensors must be capable of collecting temperature data at least once every hour, and recording or storing data for up to 30 days.

System should have a visual display so that temperatures can be reviewed manually during the treatment, and for ease of calibration.

Printout must identify each sensor and indicate time and temperature. An identification number has to be printed so that the recorder and printout can be matched.

If the recorder is to be carried inside the container, the data should be accessible without opening the container.

At least three sensors are necessary for each container.

Warehouses Used for Cold Treatment

Requirements for Approval of Structures and Equipment

Fruit which have not received CT in transit may be treated in accordance with Quarantine 56 (7CFR 319.56-2d) in approved refrigerated warehouses. As with the intransit treatments, a temperature recorder is required to verify that the proper temperature be maintained for the specified period. In addition to the general requirements, warehouse approval is subject to specific geographical pest-risk considerations.

Firms interested in obtaining approval are required to submit specifications on the refrigeration units and recording equipment to the Center for Plant Health Science & Technology (CPHST). The performance survey, approval (see M390.480 and M390.610) and clearance of treated fruit, will be made by local PPQ inspectors. Cold treatment facilities are approved for 1 year from the date of inspection. Warehouse must be designed with adequate refrigeration, insulation and thermostatic control to precool and hold fruit temperatures at 2.2°C (36°F) or below for the entire treatment period. Proper design is necessary to assure good distribution of cooled air so that all parts of the warehouse are maintained at approximately the same temperature level.

The following information should be submitted when applying for approval.

1. Name and address of the firm owning the warehouse chamber and the address of the warehouse location.
2. A drawing of each warehouse, including dimensions, cubic capacity, and door locations.



May be hand-drawn, but must clearly show location of refrigeration units, circulation fans, temperature recorder, and sensors.

3. The type, model, and year of the refrigeration system.
4. The type, model, and year of circulation system with specifics as to the number of air changes and direction of air flow.
5. The type of temperature recorders and sensors to be installed (must be USDA approved), see the section **Standards for Temperature Recording Systems**, under **Vessels Used for Intransit Cold Treatment**.
6. The number of sensors and length of the cable of each sensor. Cables have to be long enough so that all areas of the load can be reached.
7. The number of temperature sensing elements required per shipment will vary with the quantity of fruit. The minimum requirement is three (3) sensors—one (1) for measuring air temperature, and two (2) for measuring pulp temperatures. For each 10,000 ft³ (283 m³) of fruit or part thereof, another pulp sensor must be provided.

EXAMPLE: Fruit shipment totals 28,000 ft³ (792 m³) or 14,000 cases of 2 ft³ (.6 m³) per case.

First 10,000 ft³ (283 m³) 3 sensors (minimum)
Next 10,000 ft³ (283 m³) add 1 sensor
Next 8,000 ft³ (226 m³) add 1 sensor
Total 28,000 ft³ (792 m³) requires 5 sensors (minimum)



If a refrigerated room is equipped according to the cubic capacity of the storage area (rather than of the load itself), the same criteria apply.

It is highly recommended that additional sensors be installed beyond the required minimum.

Methods of segregating fruit under treatment and securing it from unauthorized movement must be addressed.

